

Claims

1. A method for forming a spacer (44) for a first structure (24, 124) and a spacer for at most a portion of a second structure (14), the method comprising the steps of:
depositing a first material (20);
5 forming a second material (22, 122) over the first material;
forming the first structure from the first and second materials;
making the second material overhang (40, 140) the first material; and
forming a spacer (44) under the overhang.
- 10 2. The method of claim 1, wherein the second structure (14) is made of monocrystalline silicon, and the first material (20) is made of polycrystalline silicon.
3. The method of claim 1, wherein the second material (22) is formed such that the second material has a faster oxidation rate than the first material.
- 15 4. The method of claim 3, wherein the second material includes a dopant including at least one of the group comprising: Arsenic, Germanium, Cesium, Argon and Flourine.
5. The method of claim 3, wherein the second material is a deposited polycrystalline
20 silicon-germanium alloy.
6. The method of claim 3, wherein the step of making includes oxidation to form the overhang as a result of a differential oxidation rate of the second material (22) with respect to the first material (20).
- 25 7. The method of claim 3, wherein the step of making includes forming oxide (34) on sides of the first structure (24) and the second structure (14).
8. The method of claim 1, wherein the second material (122) has different thermal
30 reflow properties than the first material.

9. The method of claim 8, wherein the second material (122) is one of BPSG and PSG.
10. The method of claim 8, wherein the step of making includes heating the second material to cause the second material to reflow to form the overhang (40, 140).
- 5 11. The method of claim 1, wherein the step of forming the spacer (44) includes:
depositing a spacer material (42); and
directionally etching the spacer material away except under the overhang (40, 140).
- 10 12. The method of claim 11, wherein the spacer material (42) is at least one of silicon nitride and silicon oxide.
- 15 13. The method of claim 1, wherein the first structure (24, 124) is a gate and the second structure (14) is a fin of a FinFET (100).

14. A method for forming a gate structure (24, 124) and associated spacer (44) for a FinFET, the method comprising the steps of:
- depositing a first gate material (20) over a fin of the FinFET;
 - forming a second material (22, 122) over the gate material, wherein the second material has a faster oxidation rate than the gate material;
 - forming the gate structure into the gate material and the second material;
 - oxidizing to cause the second material to overhang (40) the gate material; and
 - forming a spacer (44) under the overhang.
15. The method of claim 14, wherein the fin (14) is made of monocrystalline silicon and the gate material (20) is polycrystalline silicon.
16. The method of claim 14, wherein the second material (22) is a polycrystalline silicon formed such that the second material has a faster oxidation rate than the first material.
17. The method of claim 14, wherein the step of oxidizing also forms oxide (34) on sides of the structure (14) and gate (24).
18. The method of claim 14, wherein the step of forming the spacer (44) includes:
- depositing a spacer material (42); and
 - etching the spacer material away except under the overhang (40).

19. A FinFET comprising:

a gate structure (24, 124) including an electrically conductive lower portion (32, 132) and an overhanging top portion (30, 130);

a fin (14) extending through the lower portion; and

a spacer (44) positioned under the top portion of the gate structure adjacent to the lower portion.

20. The FinFET of claim 19, wherein the top portion (30, 130) is made of one of oxide and glass, and the lower portion (32, 132) is made of polycrystalline silicon.

21. The FinFET of claim 19, wherein the spacer (44) surrounds the lower portion (32, 132) and portions of the fin (14) adjacent the gate (24, 124).